

State of EIC:

News and near term prospects



EICUG Meeting
Argonne National Laboratory
July 7th, 2016

On the menu:

Mostly what has happened since the UCB meeting

- The EICUG status, organization & next steps
- The National Academy's Review of the EIC
- EIC Physics
 - Refinement of some already explored physics topics
 - Physics beyond the EIC White Papers: initiatives
- EICUG Connections in the broader context
 - Continue to learn from HERA? Ideas for mutual benefit
 - International perspective & outreach: talks/sessions at conferences

EICUG

As of today:

651 Collaborators, 142 Institutions & 27 countries

EICUG Today:

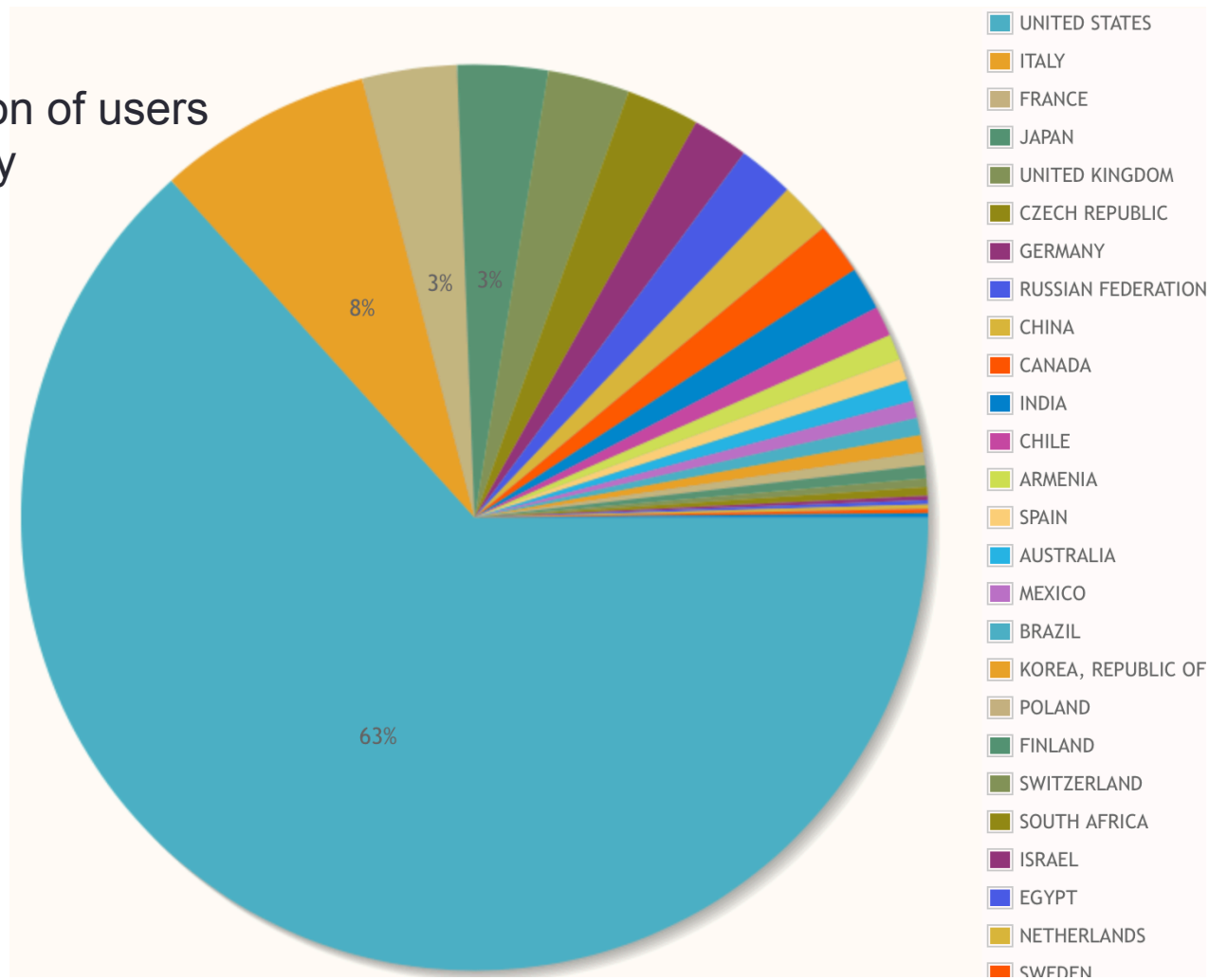
350 experimentalists, 111 theorists, 141 accelerator-physicists, 43 unknowns



EICUG Today: 651 Users, 142 Institutes, 27 Countries

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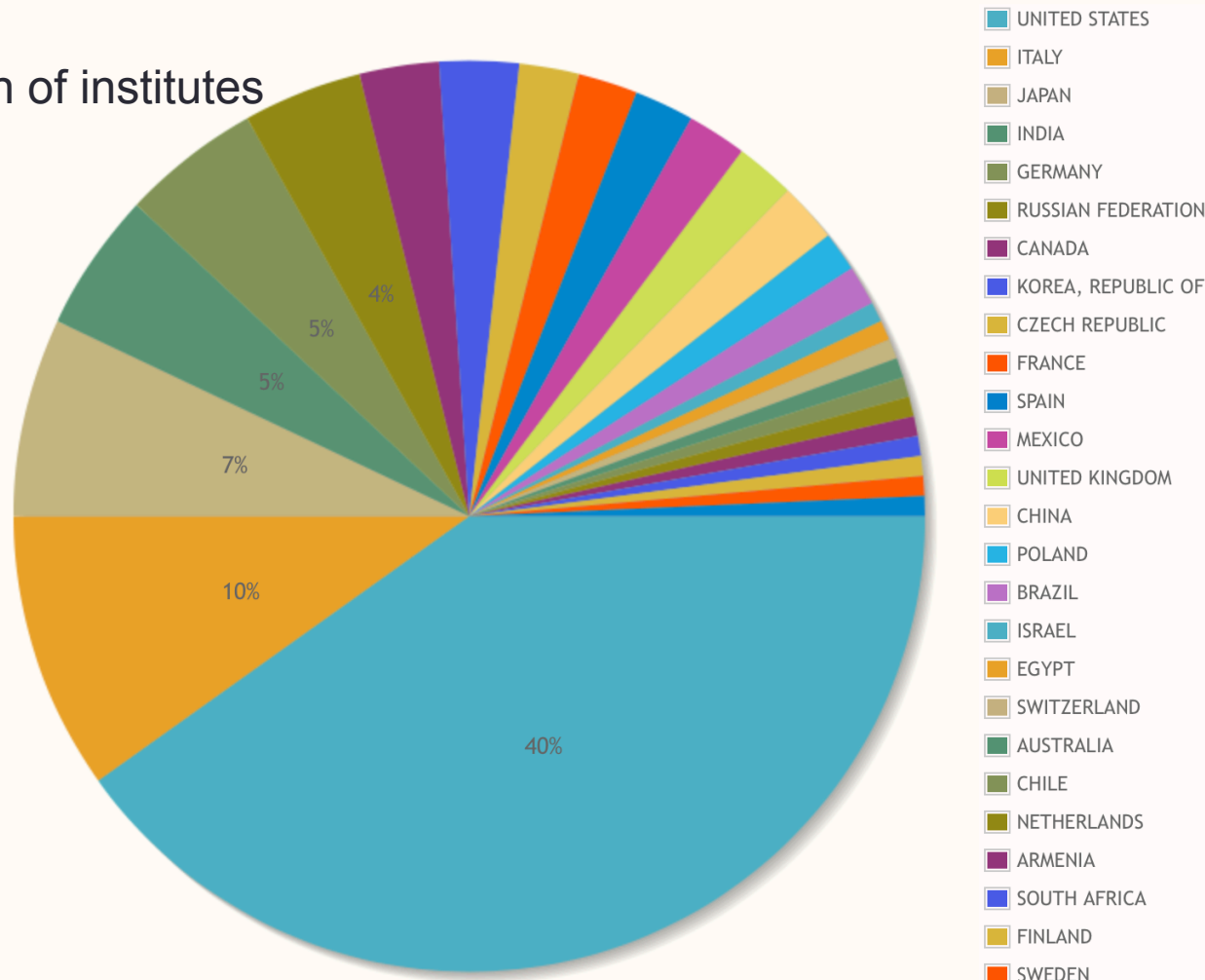
Distribution of users
by country



EICUG Today: 651 Users, 142 Institutes, 27 Countries

350 experimentalists, 111 theorists, 141 accelerator-physicists, 43 unknowns

Distribution of institutes
by country



EICUG Charter

- We decided to appoint an international committee with a broad representation of experience & nations to write a draft charter for the EIC Users Group
- Writing Group:
 - C. Aidala (U. Michigan), Y. Goto (RIKEN), W. Horowitz (Cape Town), C. Hyde (ODU), R. Milner (MIT, Co-Chair), S. Dalla Torre (Trieste), S. Salur (Rutgers), B. Seitz (Glasgow), S. Vigdor (Indiana), R. Yoshida (Co-Chair, JLab/ANL)
- First draft released April 22; Official comment period May 29, but accepted comments later.
- The Charter was put for a vote on Doodle June 14, initial deadline June 29, extended to July 4, 2016 (still open if you want to vote)

EIC Users Group Charter Vote Result

- Charter voting request to 631 members (EICUG on 06/14)
 - A 50% Quorum suggested in the charter needed 316 votes for an acceptable outcome
 - **July 4th Status:**
 - **397 VOTES: 384 (ACCEPT), 3 (REJECTS), 10 ABSTAIN**
- EIC Charter is hence accepted with overwhelming majority vote.
- Congratulations to you all!
 - Let us thank the Charter Writing Group for their effort & contribution to this very **first and important step in forming the EICUG.**

What next on EICUG?

- **Institutional Board** (one representative from each member) is being energized/alerted.
 - First email went out (6/30) to the IB members to acknowledge/confirm to be the IB member. ~60% have responded in positive. Remaining ones, please do so soon. (Second reminder on the way)
 - **We plan to have a first meeting of the IB soon**
- Formation of the **Steering Committee & Election for its officials** as defined in the Charter will proceed in the next couple of months
- *Your input, participation and advice/input on all of these are most important, please do not ignore emails with subjects starting with **EICUG**.*

News From The NSAC

DOE's approach on the EIC

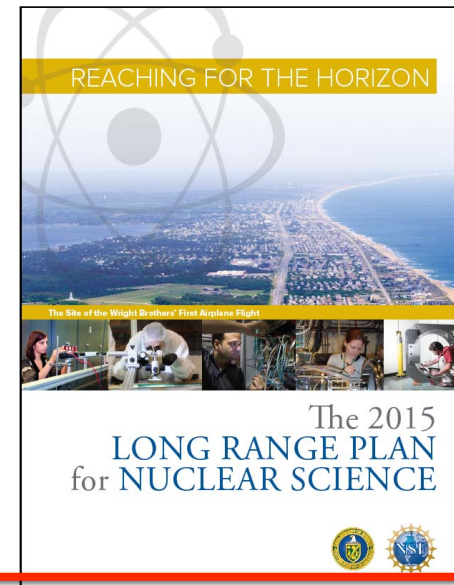
T. Hallman, Office of NP at the NSAC meeting March 23, 2016

The 2015 Long Range Plan for Nuclear Science

NSAC and APS DNP partnered to tap the full intellectual capital of the U.S. nuclear science community in identifying exciting, compelling, science opportunities

Recommendations:

- The progress achieved under the guidance of the 2007 Long Range Plan has reinforced U.S. world leadership in nuclear science. ***The highest priority in this 2015 Plan is to capitalize on the investments made.***
- The observation of neutrinoless double beta decay in nuclei would...have profound implications.. ***We recommend the timely development and deployment of a U.S.-led ton-scale neutrinoless double beta decay experiment.***
- Gluons...generate nearly all of the visible mass in the universe. Despite their importance, fundamental questions remain.... These can only be answered with a powerful new electron ion collider (EIC). ***We recommend a high-energy high-luminosity polarized EIC as the highest priority for new facility construction following the completion of FRIB.***
- ***We recommend increasing investment in small-scale and mid-scale projects and initiatives that enable forefront research at universities and laboratories.***



NP is implementing these recommendations which are supported in the President's FY 2017 request

T. Hallman, Office of NP at the NSAC meeting March 23, 2016

Next Formal Step on the EIC Science Case

THE NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE

Division on Engineering and Physical Science

Board on Physics and Astronomy

U.S.-Based Electron Ion Collider Science Assessment

Summary

The National Academies of Sciences, Engineering, and Medicine (“National Academies”) will form a committee to carry out a thorough, independent assessment of the scientific justification for a U.S. domestic electron ion collider facility. In preparing its report, the committee will address the role that such a facility would play in the future of nuclear science, considering the field broadly, but placing emphasis on its potential scientific impact on quantum chromodynamics. The need for such an accelerator will be addressed in the context of international efforts in this area. Support for the 18-month project in the amount of \$540,000 is requested from the Department of Energy.

Mail reviews received; proposal approved for funding in PAMS; PR package in PAMS being processed.

Progress is also being made on a second Joint NAS study on Space Radiation Effects Testing



U.S. DEPARTMENT OF
ENERGY

Office of
Science

NSAC Meeting

March 23, 2016

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The NRC/NAS review

- A blue ribbon committee of experts in the field & some outsiders who will evaluate and comment on the importance of the SCIENCE OF EIC
 - A similar review of the previous large projects within the office of science
 - Schedule of presentations and discussions yet unknown but expect to learn in the next couple of months, with activity in Fall 2016 & Spring 2017.
- Discussion within the EICUG:
 - Science based on EIC White Paper (mature for presentation)
 - Is the presentation developed for the Long Range Plan (2015) appropriate or could it be improved?
 - What new topics could be presented to such a panel that are of interest to the new members of the EICUG?
 - How can we all help and participate?
- Full session associated with this tomorrow (July 8th, AM)

T. Hallman, Office of NP at the NSAC meeting March 23, 2016

Seeding the Possibility of a Future Electron Ion Collider

NP Planning for EIC Accelerator R&D

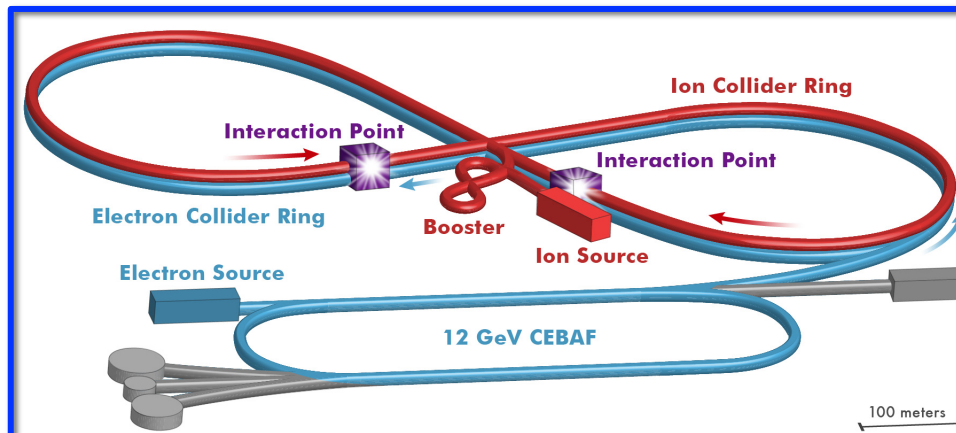
In view of Recommendation III in the 2015 LRP report on the realization of an EIC, NP is fomenting a plan in discussion with EIC stakeholders:

18 months NAS study:	US-BASED ELECTRON ION COLLIDER SCIENCE ASSESSMENT
March - July 2016:	Competitive FOA published this month, proposals due May 2 to select and fund accelerator R&D for Next Generation NP Facilities for 1 year only.
Summer 2016	Conduct an NP community EIC R&D panel (EIC-R&D) Review charged with generating a report as basis for FY17-FY20+ EIC accelerator R&D funding. <u>NP to appoint Chair of the panel</u>
Late Fall 2016:	Use the EIC panel report from the panel to publish a new Accelerator R&D FOA for FY2017 funding.

Funding amount and source for EIC accelerator R&D in FY17 and beyond:

Funding level:	Aiming for \$7M, exact amount to be guided by EIC-R&D Review's report
Funding sources:	~\$1.9M from NP competitive pot, the rest generated by percentage tax to RHIC and CEBAF Accelerator Operations budgets (~2.6% FY17 president request for each Lab).

Accelerator designs....



F. Pilat, JLEIC

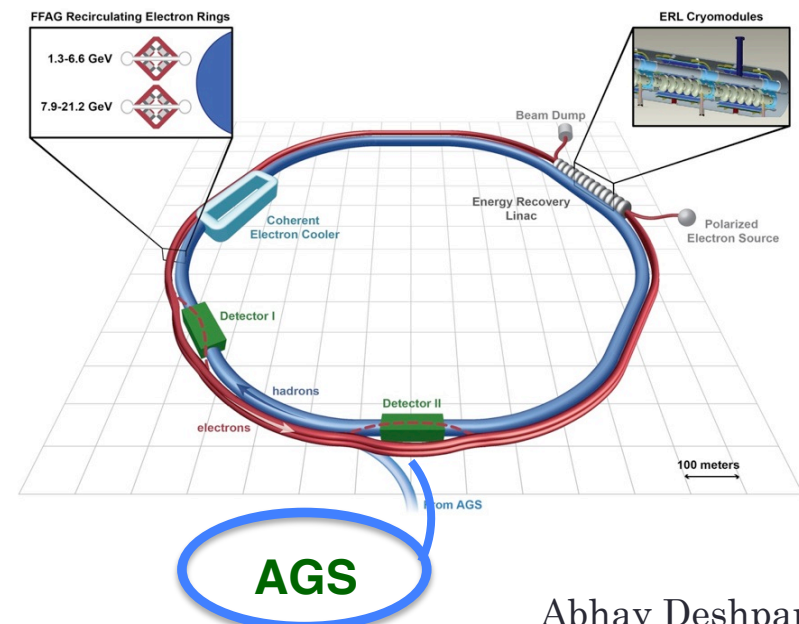
Ring-Ring Design

Bow-Tie shaped ring to address the polarization preservation without Siberian snakes

V. Ptitsyn, eRHIC

Linac-Ring design
(also developing a Ring-Ring design)

Uses existing Blue Ring from RHIC
And a multi-pass 1.3 GeV ERL



EIC Detector R&D

Just finished a 2-day review of various activities on the technologies and plans for EIC detector designs

https://wiki.bnl.gov/conferences/index.php/July_2016

Funded at about \$1.3M managed from BNL (T. Ullrich). Motivated by new proposals currently exploring possibility of increasing this number substantially. *Discussions with the DOE to be initiated soon. Impact only in/after FY18, unlikely before.*

July 6th, 2016

Wednesday, July 6, 2016			
08:00	Registration		
08:00	Committee Executive Session - Building 203, R-150		
	Title	Speaker	Slides
08:30	Welcome and Overview	Thomas Ullrich (10'+5')	
08:45	JLEIC - Detector Requirements and R&D Needs	Rik Yoshida (25'+5')	
09:15	eRHIC - Detector Requirements and R&D Needs	Alexander Kiselev (25'+5')	
09:45	eRD1 - EIC Calorimeter Development	Oleg Tsai/Tanja Horn (30'+5')	
10:20	Coffee Break		
10:40	eRD2 - A Compact Magnetic Field Cloaking Device	Nils Feege (20'+5')	
11:05	eRD3 - Lightweight barrel and forward tracking prototype systems for an EIC	Bernd Surrow (20'+5')	
11:30	eRD6 - Tracking/PID Consortium	Tom Hemmick (35'+5')	
12:10	Lunch Break and Committee Executive Session - Building 203, R-150		
13:15	eRD12 - Polarimeter, Luminosity Monitor and Low Q2-Tagger for Electron Beam	Richard Petti (20'+5')	
13:40	eRD14 - PID Consortium	Pawel Nadel-Turonski (35'+5')	
14:20	eRD15 - Compton Electron Detector R&D	Alexandre Camsonne (20'+5')	
14:45	Coffee Break		
15:05	eRD16 - Forward/Backward Tracking at EIC using MAPS Detectors	Ernst Sichterman (20'+5')	
15:30	eRD17 - DPMJetHybrid 2.0: A Tool to Refine Detector Requirements for eA Collisions in the Nuclear Shadowing / Saturation Regime	Mark Baker (Video) (20'+5')	
15:55	Committee Executive Session - Building 203, R-150		



Today July 7th, 2016 AM Session

Thursday July 7, 2016			
08:00	Committee Executive Session - Building 203, R-150		
	Title	Speaker	Slides
8:30	Proposal to Develop Imaging Hadron Calorimetry	José Repond (20'+5')	
8:55	Performance characteristics of the SiD detector for deep inelastic events at the electron-ion collider	Jose Repond (20'+5')	
9:20	Proposal to Realize Radiation Tolerant Magnetic Immune Radiation Detector Readout Using Optical Phase-modulation-based Electro-optical Coupling	Wenze Xi (20'+5')	
9:45	Precision Central Silicon Tracking & Vertexing for the EIC	Laura Gonella, Peter Jones (20'+5')	
10:10	Coffee Break		
10:30	Precision Timing at the Electron Ion Collider	Christophe Royon, Michael Murray (20'+5')	
10:55	4D Tracking Detectors: Monolithic Fast Timing Silicon Detectors	TBD (20'+5')	
11:20	R&D Proposal for Detailed Simulations of Machine Background Sources and the Impact to Detector Operations	Elke Aschenauer (20'+5')	
11:45	Developing Analysis Tools and Techniques for the EIC	Markus Diefenthaler (20'+5')	
12:10	Lunch Break & Committee Executive Session - Building 203, R-150		
13:00	Close-Out - First Impressions		
13:30	Adjourn and Start of EIC User Group Meeting		

EIC Physics

Connections and Opportunities

Beyond the EIC White Paper Sessions organized by (Accardi, Cloet, Fazio, Sievert) on 7/8 PM after lunch

- Novel Observables, Technologies, Probes
- Nucleon/Nuclear structure at low/high- x & phenomenology

Other possibilities/opportunities have been discussed with the HERA experimental collaboration

EIC/HERA meeting at DESY

<https://indico.desy.de/conferenceDisplay.py?confId=14768>

Sunday 10 April 2016

- | | |
|---------------|--|
| 14:00 - 14:05 | Introduction 05'
Speaker: Matthew Wing (UCL)
Material: Slides  |
| 14:05 - 14:25 | EIC perspective 20'
Speaker: Abhay Deshpande (Stony Brook)
Material: Slides  |
| 14:25 - 14:45 | H1 perspective 20'
Speaker: Stefan Schmitt (DESY)
Material: Slides  |
| 14:45 - 15:05 | ZEUS perspective @DESY 20'
Speaker: Achim Geiser (DESY)
Material: Slides  |
| 15:05 - 15:25 | Hermes perspective 20'
Speaker: Gunar Schnell (University of the Basque Country Bilbao)
Material: Slides  |
| 15:25 - 15:45 | ZEUS for EIC @MPI 20'
Speaker: Andrii Verbytskyi (Max-Planck Institut für Physik)
Material: Slides  |
| 15:45 - 16:05 | Work at BNL using HERA data 20'
Speaker: Elke-Caroline Aschenauer (BNL) |

ZEUS, H1, HERMES spokespeople Attended, along with a brief visit for discussion by DESY research director.

Message given was that there are significant fraction of HERA-II luminosity data that needs to be analyzed and deficit of students.

Some of these analyses of interest to EIC in the future.
[Should we \(not\) participate and get our students & post docs real data analysis experience for EIC?](#)

Example analyses... not a full list

- ZEUS: (collider, polarized e & un-polarized p)
 - DVCS with HERA-II Luminosity, Exclusive phi, rho meson production, high-x measurements in to PDF fits, Jets in DIS and photo-production & diffraction, charm in charged currents,...
- H1: (collider, polarized e & un-polarized p)
 - Charged current cross section in low-energy runs, Diffractive cross sections and pdf fits, J/Psi photoproduction: double differential measurements, Psi'prime and Upsilon cross sections, light vector meson production, leading neutron production in photo-production, DIS, DVCS, Strangeness studies (hadronic final states), jets, charge symmetry at high Q^2 , heavy flavors,...
- ZEUS + H1:
 - Combined pdf fits for F_L and Diffractive PDF fits
- HERMES (fixed target polarized e & polarized h)
 - Lambda polarization high luminosity, pi0 and eta, A_{UT} for protons & K_s , fracture functions



How it would work?

An advanced graduate student or post doc visits DESY for 1-2 months, get trained to access data with a local expert. **Continues analysis with his/her advisor in collaboration with H1/ZEUS expert. If publishable, they become H1/ZEUS collaborators for that publication.**

Possible short term support for a few weeks to a month visit may be possible.

Imagine 1 or 2 test cases to be initiated in the next six months. If successful, we could expand the program to up to 3-4 a year at most (in consultation with the DESY collaborators).

Disclaimers: This is **not** intended to be a large program. This could not be the only thing a US student (for example does) for his/her Ph.D. or Masters degree.

If you are interested, we could talk... more

Conferences etc...

- Routinely get requests for conference presentations.
- With the EICUG in place, and SC anticipated, we will identify people within to identify and help/prepare new people giving talks.
 - Elke, Rolf, Thomas, and myself made a list of possible speakers. This will go on to a page accessible to the EICUG. However, please contact us: Volunteers welcome if you would like to give talks on EIC.
- All upcoming major meetings should have high level as well as contributed talks, and we should/will pursue EIC related sessions at APS, JPS, EPS meetings of interest. (Examples...)
 - A 4-institute 4-day visit to Japan in Aug. 2016 organized by EIC-Japan
 - Satellite meeting on EIC on one evening at INPC 2016, Adelaide Australia

Summary

- After the EIC meeting at UCB a lot of activities have begun on many fronts related to the EIC
 - EICUG is being organized, by the next meeting hope to have many of its structures and activities initiated.
 - DOE is initiating various processes necessary for the EIC's realization
 - The Labs continue to support progress on EIC machine design etc.
- International component and collaboration is going to be critical on all fronts: Let us see how best we can help each other and realize the EIC.
- Thank you all for coming or listening on the BlueJeans and I hope we have another great meeting.

Structure... to be organized in the next couple of months...

- Institutional board with an *adhoc* chair organizes the elections for the Steering Committee
 - 5 Elected members of the IB (Chair, Vice-Chair, +3)
 - 2, one each, elected by Asians and Europeans
 - 2 Nominated by the Labs
 - Chair of the IB (ex-officio)
- Chair of the Steering Committee
 - Will organize the official election of the IB Chair
 - Will organize Election and Nomination Committee for future elections
- The Steering Committee/Group will help/organize/steer the activities of the EICUG according to the charter, with input about the needs and wishes of its members
 - Organize regular meetings, identify speakers for various conferences, support and maintain an EIC Web Site, organize working groups